Journal of Education Technology and Information System Vol (01) Ed (01) P.01-05 (2025)
Received October 2024 / Revised January 2025 / Accepted February 2025

Journal of Education Technology and Information System

https://journal.unesa.ac.id/index.php/jetis/

A System Interface Design of Free Open Resource for Geospatial Data and Software (FORGeDS): A Spatial Data and Tools Cloud Storage Application

Adzanil Rachmadhi Putra[1*], Fatwa Ramdani[2], Purnama Anaking[1]

[1] *Information System, School of Industrial Engineering, Telkom University,*
Jl. Telekomunikasi 1, Bandung 40379, Indonesia
adzrachmadhip@telkomuniversity.ac.id , purnamaanaking@telkomuniversity.ac.id
[2]*Institute of Humanities and Social Sciences, University of Tsukuba,*
1 Chome-1-1 Tennodai, Tsukuba, Ibaraki 205-8577, Japan
fatwa.ramdani.gw@u.tsukuba.ac.jp

Abstract. Geospatial data is an essential element in areas such as spatial planning, natural resource management, disaster mitigation, and transportation planning. However, managing this data requires specialized software, such as QGIS and ArcGIS, which operate offline and do not include the required spatial data directly. The process of acquiring geospatial data, whether through field surveys or accessing online platforms, is often time-consuming and not always as specific as needed. One of the platforms that provide geospatial data in Indonesia is the Geospatial Information Agency (BIG), but complicated access procedures are often a barrier for users This study aims to design FORGEDS (Free Open Resource for Geospatial Data and Software), an open-source portal that provides geospatial data and tools that can be accessed easily without going through a complicated login process. Using a Human-Centered Design (HCD) approach with the PACT Framework (People, Activities, Contexts, Technologies), the system is designed to provide an intuitive and efficient user experience. FORGEDS is also built with CSS Bootstrap Framework and Laravel Framework to ensure responsive interface and feature development flexibility. FORGEDS is expected to be an inclusive and efficient solution in the utilization of geospatial data, as well as encourage the use of open-source technology in the wider community.

Keywords: FORGEDS; Geospatial Information System (GIS); Human Centered Design; Open-Source Platform; PACT Framework

1. Introduction

Geospatial constitutes an important aspect in many fields such as spatial planning, natural resource management, disaster mitigation, and transportation planning and Management. Not to mention Geo-economy and Geo-Politics Analysis, geospatial data plays important role as well. geospatial data enables Researchers, Government, and Industry players to understand geographic patterns, change, and interactions that have a direct impact on decision making process (Achilleas et al, 2013).

The Use of geospatial data require specific tools or software to processes, to visualize, process, and analyse. Among much software to manage geospatial datas are QGIS, ArcGIS. That two software are offline tools that requires to install on desktop environment. However, QGIS and ArcGIS which will be refer as GIS Tools, not provided a spatial data we need. Hence, we must find our own geospatial data form another source. Those processes in acquiring geospatial data called geospatial data acquisition. The source of geospatial data acquisition can be acquired via offline which the researchers conduct a field survey. This method requires time, yet provide an accurate and specific data which researchers need to conduct for their researches. The other method requires less time to

take because researcher need to access it online through various online platforms, yet they can't acquire the data specifically as desired. However, this method still widely used today because the platform already provides various types of data needed (Gulliksen et al, 2013).

One example of a platform that provides geospatial data in Indonesia is the government geospatial agencies called "Badan Informasi Geospatial" or BIG for short. BIG Provides a wide range of relevant data and information regarding the geospatial. But to access it, users are often faced with cumbersome process such as login, register, email verification, work verification. But on the other hand, the data contains in this platform has such validity resource thanks for the valid metadata on it, not to mention these geospatial datas are free for downloads. This creates barriers to quick and easy access to geospatial data, which should be the foundation of data-driven decision support (Horton et al, 2020).

To address these issues, this study aims a system design for Free Opensource for Geospatial Data and Software which will be refer as FORGEDS for short. FORGEDS is a portal that provides various geospatial and tools in an open-source format that can be accessed easily without any cumbersome or complicated procedures, yet it also has a valid geospatial data and meta data because the data which will be fetched mostly from BIG Platform. The design method of the systems using one of Human Centered Design framework called PACT Framework. It consists of People Activities Context and Technologies that allow create meaningful and effective design of FORGEDS.

2. Methods

Provide sufficient detail in the methods section to enable the replication of the work. If methods have been previously published, indicate them with a reference, and describe only the relevant modifications.

2.1. Human Centered Design

The process of ensuring people as a user requierement are met, that the end-product must be not only understandable and usable, but also provide an enjoyable and positive experience. Effective design must satisfy many constraint and concerns, including shape and form, cost and efficientcy, reliability and effectiveness. The HCD Consist of several process including 1). Observation, 2). Ide Generation, 3). Protyping, 4). Testing. These four activities conducting iteratively.

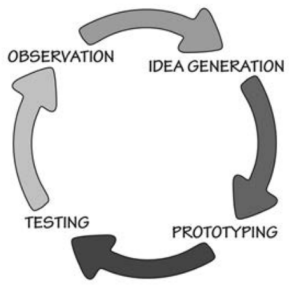

Figure 1 Human Centered Design Processes (Norman, D., A., 2013.)

2.2. PACT Analysis

A Subsequent challenge of this study emerge to pick a HCD framework, The PACT Framework. It consists of People, Activity, Context, and Technology. 1). People: It's a common knowledge that humans are different in any other ways. There are some important factors need to be considered, such as Physical Difference: Every human has different set of Physical characteristics and the different senses. The Physicological Difference: The physcological aspects of humans play a major role in application design. The people could find information or the way to work with the application quickly can take an advantage. 2). Activities: Humans may conduct many activities that the esigners have to

keep in mind for. Some activities tend to be highly complex and some to be simple. First, the designer should understand what the purpose of the activity is and then the main features that would support the main activity such asTemporal aspects: It is to understand how frequently a task being carried out and how's its frequency is.

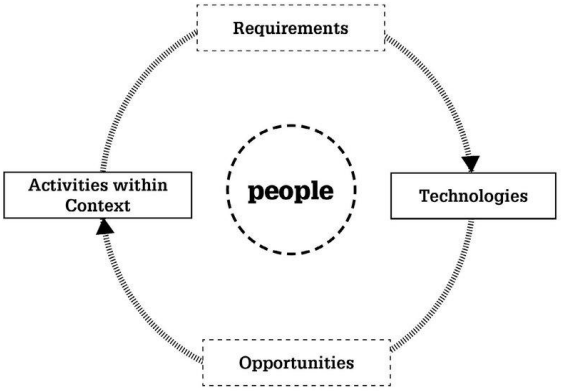

Figure 2 Storage performance result (Achilleas & Biloria, 2013)

3). Context: Activities happen in the context. Activities and context should be analyzed together. There are two main types of contexts to be distinguished. 1) Social context: A supportive environment will give plenty of support to the user to carry out the tasks in hand. It can vary from using a product to traveling on a train. If the environment is more supportive people can complete the activity in the context more easily. 2) Organizational context: It is important to understand the organizational context because the change of technology always impacts on power structure and communication. The need for new technology comes from the requirements of the humans when performing activities. It can be a very vast amount of the knowledge that the designer must grab when designing for organizational context.

3. Results and Discussion

3.1. The Proposed FORGEDS Interfaces

FORGEDS interface initiate with Cascading Style Sheet (CSS) Frameworks, Bootstrap. Bootstrap is a powerful, extensible, and feature-packed frontend roolkit. With this frameworks, enables FORGEDS have responsive capabilities, meaning it can be opened in various monitor size, even in smartphone size. The Figure 3 show the home screen of FORGEDS.

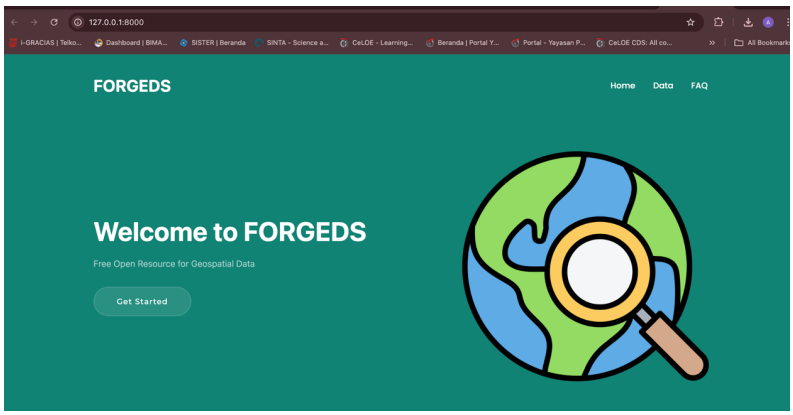

Figure 3. FORGEDS Home Screen

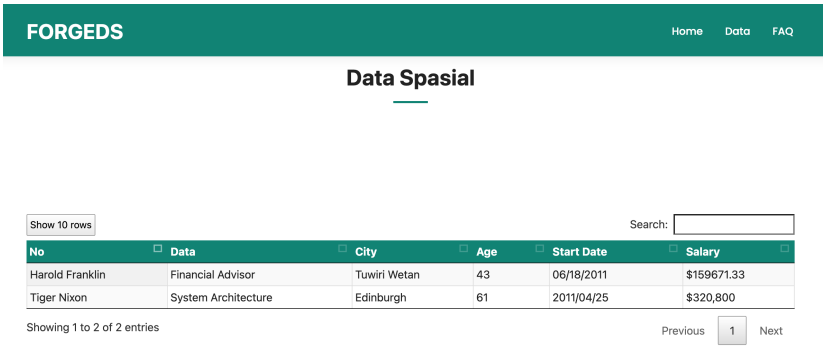

Figure 3. FORGEDS Data Tables

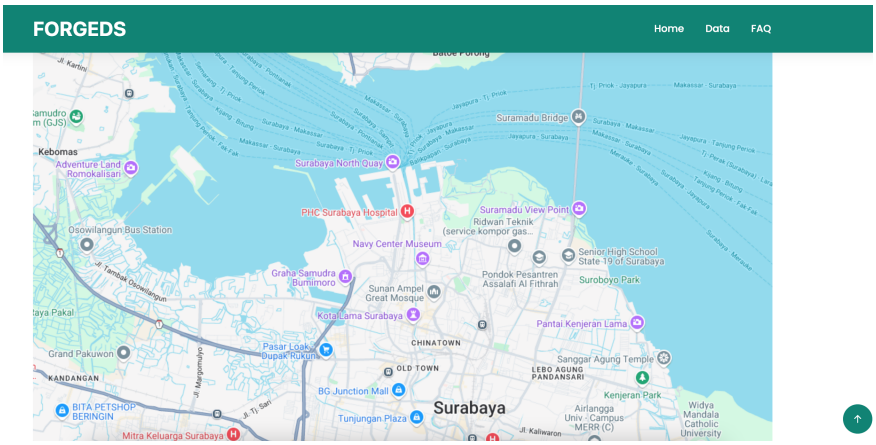

Figure 4. FORGEDS Data Details Page

3.1.1.Utilizing Laravel PHP Framework

This interface using Laravel Framework to make more efficient in building FORGEDS interfaces. Laravel using blade templates in order to load needed and unload the not needed components, thanks for the blade template engines.

4. Conclusions

FORGEDS (Free Open Resource for Geospatial Data and Software) comes as an innovative solution to overcome access barriers to geospatial data and tools. This application makes it easy for users to access various geospatial datasets and software such as QGIS and ArcGIS, without having to go through a complicated login process, as found on similar platforms. In its development, FORGEDS applied the Human-Centered Design (HCD) approach with the PACT Framework (People, Activities, Contexts, Technologies), which focuses on user needs and experience. The interface design is made to be intuitive and easy to use by various types of users, whether from academia, practitioners, or government. FORGEDS was built using CSS Bootstrap Framework to ensure responsiveness and consistency of the interface, while Laravel Framework with Blade Template was used to simplify the management of interface elements, allowing developers to add or modify features flexibly. This approach allows FORGEDS to remain adaptive and relevant as technology and user needs evolve. Thus, FORGEDS is expected to become a more inclusive and efficient platform, and encourage the wider utilisation of geospatial data to support various fields such as spatial planning, natural resource management, and disaster mitigation. The implementation of open-source technology used also plays an important role in reducing dependence on commercial software, thus creating wider and equal access for all.

Acknowledgments

We would like to thank all those who have contributed to the development of FORGEDS (Free Open Resource for Geospatial Data and Software). Our thanks go to colleagues in the geospatial community who have provided valuable input on the use of open-source data and software. We would also like to thank the team of developers and designers who have worked hard to design the interface of this application using the human-centred design approach and the PACT framework, as well as the technical team who have ensured that FORGEDS can be built using the Laravel framework and Bootstrap to create a responsive and flexible application. Finally, we would like to acknowledge the academic and professional parties who provided insights on the importance of open access to geospatial data. The support of educational and research institutions that focus on geospatial technology is also very important for the realisation of FORGEDS as an open source portal that is easily accessible and useful for many people.

References

Achilleas, P & Biloria, N. (2013). Urban Media Geographies: Interfacing Ubiquitous Computing with the Physicality of Urban Space.

Gulliksen, J., et al. (2003). Key principles for user-centered systems design. *Behaviour & Information Technology*, 22(6), 397-409.

Horton, J., & George, A. (2020). Learning Bootstrap 4: Develop Responsive Web Sites. Packt Publishing.

International Organization for Standardization (ISO) 9241-210:2010. Ergonomics of Human-System Interaction - Part 210: Human-Centred Design for Interactive Systems. ISO Standard.

Nielsen, J., & Molich, R. (1990). Heuristic Evaluation of User Interfaces. *Proceedings of the SIGCHI Conference on Human Factors in Computing Systems.* DOI: 10.1145/97243.97281

Norman, D.,A., 2013. The Design of Everyday Things. The MIT Press: Cambridge, MA., 2013.

Otto, M., & Thornton, J. (2023). Bootstrap Documentation.

Otwell, T. (2023). Laravel Documentation.

Shneiderman, B., & Plaisant, C. (2010). Designing the User Interface: Strategies for Effective Human-Computer Interaction (5th ed.).

Spurlock, J. (2016). Bootstrap: Responsive Web Development (2nd ed.). O'Reilly Media.

Stauffer, M. (2022). Laravel: Up & Running: A Framework for Building Modern PHP Apps (3rd ed.).